

Identified Charged Hadron Spectra from Centrality Selected Pb–Pb Collisions at 158 GeV/nucleon

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The spectra of identified charged hadrons from centrality selected Pb–Pb collisions at 158 GeV/nucleon have been measured using the NA49 experiment at the CERN SPS. These results extend those on baryon stopping and particle production in central collisions [1] to nearly the full impact parameter (b) range. In comparing to central collisions of lighter nuclei, [1] found a slight increase in stopping, scaling of particle production with system size, and a hardening of the transverse spectra of protons.

Collision centrality is determined by measuring the energy of the non-interacting portion of the beam nucleus (E_0). Events are segregated into six centrality bins by placing windows on E_0 . The b range covered by each bin is determined by detailed simulation and model study. The results of this study are shown in Table 1.

E_0/E_{beam}	σ/σ_{TOT}	b Range (fm)	$\langle b \rangle$ (fm)
0-0.25	0.050	0-3.4	2.4
0.25-0.40	0.075	3.4-5.4	4.6
0.40-0.58	0.11	5.4-7.4	6.5
0.58-0.71	0.10	7.4-9.1	8.3
0.71-0.80	0.10	9.1-10.2	9.6
0.80-	0.57	10.2-	11.5

Table 1: Centrality bins and estimated impact parameter (b).

Protons, \bar{p} , K^+ , K^- , π^+ , and π^- are detected in the four NA49 Time Projection Chambers (TPC). Track curvature and measurement of the specific ionization in the TPC gas determine the charge, momentum, and particle species. The measured spectra are corrected for tracking efficiency and backgrounds, including feed-down from weak particle decays.

Stopping, which is defined as the transport of baryons from their initial beam momentum

toward the center-of-mass, is studied with the inclusive rapidity distribution of *net* protons ($p-\bar{p}$), to remove the effect of p/\bar{p} pair production. Figure 1 shows the net proton distributions for each of the six centrality bins. The yield of

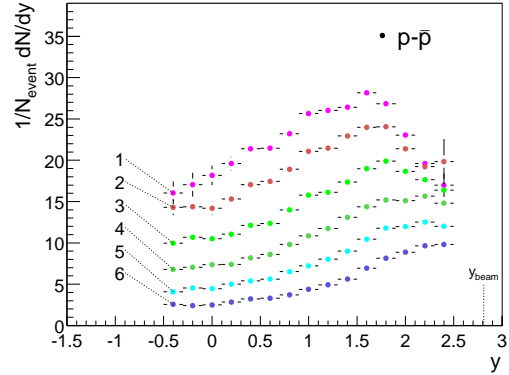


Figure 1: Net proton rapidity distribution for each centrality bin.

net protons increases with centrality as the size of the participating overlap region between the two nuclei increases. In peripheral collisions, the distribution is strongly peaked toward beam rapidity ($y = 2.81$). As the centrality increases, the forward yield is suppressed and the peak moves toward mid-rapidity ($y = 0$), indicating greater stopping. In contrast, the shapes of the pion and kaon rapidity distributions (not shown) do not change with centrality. In addition, the yield of pions scales almost linearly with the number of nucleons participating in the collision. Both the kaon and proton transverse spectra harden with increasing centrality, which is consistent with the picture of an expanding system driven by rescattering among the produced particles.

References

- [1] H. Appelshäuser *et al.*, Phys. Rev. Lett. **82**, 2471 (1999).